ure, elevated serum creatinine, preoperative ECG ischemic abnormalities or signs of hypertrophy, positive stress test, and had a worse functional status, all risk factors of MCC in that cohort (all $p \leq 0.05$). Using multiple logistic regression analysis, signs of ischemia on the immediate PO ECG remained an independent predictor of MCC (Odds Ratio (OR)=1.8; 95% Confidence Interval (CI)=1.0-3.3, p=0.05). Furthermore, stratification by initial Revised Cardiac Index showed that despite lower preoperative risk assessment (Class I-II), presence of ischemia on the immediate PO ECG identified a subgroup of patient with higher risk of MCC (OR=4.2, 95%CI=1.4-12.6). In class III-IV patients, PO ischemia was also associated with higher incidence of MCC (OR=2.0, 95%CI=1.1-3.8).
Conclusion: Signs of ischemia on the immediate PO ECG were associated with higher MCC rate, even in patients stratified at low risk preoperatively. These results argue for routine performance of the ECG in the recovery room following major NC surgery.

8:45 a.m.

884-2 Time to Relapse of Atrial Fibrillation and Signal-Averaged P Wave Duration

Ulrik Dixen, Jan Parner, Verner Rasmussen, Steen M. Pehrson, Gorm B. Jensen, *The University Hospital of Hvidovre, Copenhagen, Denmark.*

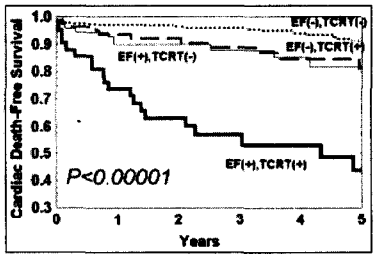
Background: Prolonged Signal-Averaged P Wave Duration (SAPD) has been established as a risk marker for atrial fibrillation. We assessed the time to first symptomatic atrial fibrillation relapse in patients with earlier or present atrial fibrillation in relation to the SAPD, clinical characteristics of the patients, and the duration of the atrial fibrillation disease.
Methods-111 consecutive patients (71/40 men/women; median age 65 years, range 30-85 years) with earlier or acute atrial fibrillation were enrolled. Patients undergoing elective cardioversion of long-lasting atrial fibrillation during the inclusion period were not included. The SAPD was measured at inclusion, and the follow-up time was six months (median 184 days; range 171-437 days). The time to first relapse of atrial fibrillation was regarded as endpoint treating deaths without atrial fibrillation and patients without relapse during follow-up as censorings.
Results- During follow-up 50 patients had a symptomatic attack of atrial fibrillation. Proportional hazard regression analysis showed a significant effect of moderately prolonged SAPD 135-145 ms (hazard ratio 3.31, CI 1.47-7.46), of severely prolonged SAPD above 145 ms (hazard ratio 2.74, CI 1.23-6.12), a common p value of 0.005, and of longer total duration of the atrial fibrillation disease than two years (hazard ratio 2.06, CI 1.13-3.75, p=0.02). We found no predictive effect of age, gender, diagnosed hypertension, the left atrial diameter or low ejection fraction.
Conclusions: Risk factors for early atrial fibrillation relapse were prolonged signal-averaged P wave duration above 135 ms, and a total duration of atrial fibrillation disease longer than two years.

9:00 a.m.

884-3 Ventricular Gradient Is an Independent Risk Factor in Survivors of Acute Myocardial Infarction

Velislav N. Batchvarov, Katerina Hnatkova, Azad Ghuran, Jan Poloniecki, Peter Smetana, A John Camm, Marek Malik, *St.George's Hospital Medical School, London, United Kingdom.*

Ventricular gradient (VG) reflects inhomogeneity of ventricular repolarisation. Its relation to prognosis in myocardial infarction (MI) is unknown. We examined multivariately the link between an optimised version of VG (TCRT, angular difference between spatial QRS and T vectors) and cardiac mortality in survivors of acute MI.
Methods: Age, left ventricular ejection fraction (EF), QRS duration on signal-averaged ECG (SAECG), ventricular ectopics/hour, mean RR interval, heart rate variability (HRV) index, heart rate turbulence slope on 24-hour Holter, and TCRT (calculated from averaged XYZ leads of the SAECGs) were measured before discharge in 1047 MI survivors (age 58±9 years, 81% men). During a follow-up censored at 5 years, 124 (12%) cardiac deaths occurred. All parameters were dichotomised by the percentile separating 20% of pts with the most risk-associated values.
Results: EF<33% (relative risk (RR) 2.9, 95%CI: 1.4-5.8, p=0.003) and TCRT<-0.88 (RR 3.4, CI 1.8-6.4, p=0.0002) were independent predictors of 5-year cardiac mortality, while HRV index<18.3U (RR 3.6, CI 1.2-11.3, p=0.03) and TCRT<-0.88 (RR 2.9, CI 1.2-7.1,p=0.02) were independent predictors of 1-year cardiac mortality.Five-year cardiac mortality in pts with both EF>33% and TCRT>-0.88 was appr. 8%, in pts with either EF<33% or TCRT<-0.88 it was appr.18%, and in pts with both EF<33% and TCRT<-0.88 it was >50% (Figure).
Conclusions: Decreased TCRT ('optimised' VG) is an independent predictor of cardiac death in survivors of acute MI.



9:15 a.m.

884-4 Does Atrial Electrical Function in Patients With Atrial Flutter Recover?

Fumiharu Miura, Hidekazu Hirao, Sou Takenaka, Yukiko Nakano, Kentaro Ueda, Kenya Sakai, Keiji Matsuda, Yukihiro Fukuda, Hiroki Teragawa, Togo Yamagata, Hideo Matsuura, Kazuaki Chayama, *First Department of Internal Medicine, Hiroshima University School of Medicine, Hiroshima, Japan.*

Background: The P wave signal-averaged electrocardiogram (PSAE) has been clinically applied to detect patients with paroxysmal atrial fibrillation. However, little is known about patients with atrial flutter (AFL). We analyzed PSAE of patients after successful catheter ablation for AFL to determine whether atrial electrical function in patients with AFL recover.
Methods: The study group consisted of 10 patients undergoing ablation of chronic counterclockwise typical AFL. The flutter cycle length was 251±7ms. The patients had documented AFL for 21±17months. The control group consisted of 20 patients without any arrhythmias. Ablation was performed by creating a linear lesion between the tricuspid annulus and inferior vena cava. AFL ablation end point was bidirectional isthmus block. PSAE was recorded 1 day, 7 days and 1 month after the ablation. We measured the filtered P wave duration (PD) and the root mean voltage (LP20, LP30) for the terminal 20 and 30 ms of the filtered P wave.
Results: All patients were no recurrence of AFL for 1 month after the ablation. The PD was significantly prolonged in patients with AFL at 1day after the ablation compared with control group (161±17 vs. 134±11ms, p=0.0003). LP20 and LP30 were lower in patients with AFL than those in control group (1.4±0.5 vs. 2.0+1.0μV; 1.9±0.2 vs. 3.0+1.6μV, respectively). PD was 161±17, 156±30 and 146±21ms; LP20 was 1.4±0.5, 2.0±0.7 and 3.0±1.0μV; LP30 was 1.9±0.2, 2.8±0.7 and 3.7±1.2μV at 1 day, 7 day and 1 month after the ablation. LP20 and LP30 were greater at 1 month than those at 1 day (p=0.002, p=0.001)
Conclusion: The findings of this study showed: 1) The PD was significantly prolonged in patients with AFL. And this prolongation was improved for 1 month after the ablation; 2) LP20 and LP30 were greater in 1 month after the ablation than those in 1 day. These findings suggest that atrial electrical dysfunction in patients with AFL recover for 1 month after the ablation. Catheter ablation for AFL can improve the electrical substrate of atrial fibrillation in patients with atrial fibrillation/flutter. PSAE may be clinical use to distinguish the patients with recurrence of AFL or atrial fibrillation from those without recurrence.

9:30 a.m.

884-5 Deficits in Knowledge Related to the QT Interval That Could Impact Patient Safety

Nancy M. Allen LaPointe, Sana M. Al-Khatib, Judith M. Kramer, Judy Battle, Robert M. Califf, *Duke Clinical Research Institute, Durham, North Carolina.*

Background: Several medications have recently been removed from the US drug market because of QT-interval (QTI) prolongation and torsade de pointes. Despite labeling changes and warnings to attempt to reduce inappropriate use of these agents and minimize the risk of torsade de pointes, inappropriate prescribing continued to occur. Since many other QTI-prolonging medications remain on the market, we conducted an evaluation of practitioner knowledge of the QTI and medications that may cause QTI- prolongation to determine if knowledge deficits exist that could partially explain the inappropriate use of these agents in clinical practice.
Methods: Practitioners were surveyed at a cardiology symposium in November 2000 and a meeting of cardiology investigators in February 2001. The number and percentage of practitioners who correctly answered questions related to the QTI were determined.
Results: A total of 334 respondents completed the survey [127 (38%) physicians, 149 (45%) nurses, 30(9%) physicians in training, 16(5%) unspecified, 5(2%) study coordinators, 4 (1%) physician assistants, and 3 (0.9%) pharmacists]. Cardiology was the area of specialization for 271 (81%) of the respondents. Eighty-six percent of respondents stated that they would measure a QTI before and after starting a QT prolonging medication. Sixty-one percent were able to identify what the QTI represented on an EKG, but only 36% were able to measure a QTI . Twenty percent were able to identify causes of QTI prolongation, and 7% were able to identify patient factors associated with increased risk of torsade de pointes. Less than 1% of respondents were able to correctly identify drugs that prolong the QTI or drug combinations that prolong the QTI.
Conclusion: Although most cardiology practitioners said that they measured the QTI when starting a QTI-prolonging medication, this survey indicated marked deficiencies in their ability to correctly measure the QTI and to identify patient factors and medications associated with QTI prolongation. This study demonstrates the need to improve practitioners' knowledge on this important patient safety issue

9:45 a.m.

884-6 Prolonged PR Interval Is Associated With Increased Risk of Atrial Fibrillation: The Framingham Heart Study

Ramachandran S. Vasan, Martin G. Larson, Daniel Levy, Eric P. Leip, Ralph B. D'Agostino, Sr., Philip A. Wolf, William B. Kannel, Emelia J. Benjamin, *NHLBI's Framingham Heart Study, Framingham, Massachusetts, Boston University School Of Medicine, Boston, Massachusetts.*

Background: P wave prolongation on the ECG is associated with increased risk of atrial fibrillation (AF). The PR interval is an easily measured marker of atrial and atrioventricular conduction. We hypothesized that prolonged PR interval may be associated with increased risk of AF.
Methods: We examined the association of PR interval, measured with digital calipers on

a resting ECG, in 7304 Framingham Heart Study subjects (3985 women; mean age 46 years) who attended a routine examination and had no prior AF. Sex-specific Cox proportional hazards regression models were used to examine the association of PR interval with risk of AF after adjusting for age, BMI, smoking, hypertension, diabetes, valve disease, MI or CHF [time-dependent covariate]), presence of atrial premature beats and left ventricular hypertrophy.

Results: On follow up (mean 21 years), 624 subjects (290 women) developed AF. In multivariable models adjusting for established risk factors, a nonlinear relation was noted between PR interval and risk of AF. Comparing subjects with short (<0.12 sec) and prolonged PR intervals (>0.20 sec) with those with a normal PR (0.12-0.20), a prolonged PR interval was associated with increased risk of AF in both sexes **(Table)**.

Conclusions: Contrary to previous reports, a prolonged PR interval is not a benign condition. It is associated with increased risk of AF, perhaps because it identifies subjects with nonuniform or delayed atrial conduction.

PR Interval and Risk Of Incident AF

Category	Men		Women	
	No. AF/ No. at Risk	HR (95% CI)*	No. AF/ No. at Risk	HR (95% CI)
Normal PR	313/3178	1.0 (Referent)	276/3778	1.0 (Referent)
Short PR	6/60	1.9 (0.8-4.3)	6/178	1.2 (0.5-2.6)
Long PR	15/81	1.7 (1.0-2.9)	8/29	3.6 (1.7-7.6)

ORAL CONTRIBUTIONS

885 Atrial Fibrillation Ablation: Clinical Outcomes

Wednesday, March 20, 2002, 8:30 a.m.-10:00 a.m.
Georgia World Congress Center, Ballroom II

8:30 a.m.

885-1 Pulmonary Vein Isolation for Treatment of Atrial Fibrillation: Impact of Age on Success and Complications

Thomas Dresing, Nassir F. Marrouche, David O. Martin, Christopher Cole, Ahmad Abdul-Karim, Robert Schweikert, Eduardo Saad, Krzystof Balaban, Patrick Tchou, Walid Saliba, Andrea Natale, *Cleveland Clinic Foundation, Cleveland, Ohio.*

Background: Isolation of the pulmonary veins (PV) guided by the circular mapping is used for treatment of atrial fibrillation (AF). We compare success rates and long term follow-up in relation to patients age. Methods and Results: One hundred and sixty-six patients (135 men; mean age 53+/-11 years) presented for focal mapping and ablation of paroxysmal (93 patients) persistent (25 patients) and permanent (48 patients) symptomatic AF. All patients failed 3 +/- 0.9 antiarrhythmic drugs (AAD). Success rate and long-term follow-up were assessed in three different age groups. 570 PVs were mapped and isolated using the circular mapping technique. The relative risk of recurrence was 2.5 fold higher in patients >= 50 years.

Conclusion: Isolation of the PVs is an effective cure for atrial fibrillation. From our preliminary data younger patients (age <50 years) seems to benefit the most from PVs isolation for the treatment of AF. Moreover, in our series the younger patients experienced no major complications. Pulmonary veins isolation could be considered as first line therapy in this group of patients.

	Age<50 Group 1	Age 50-60 Group 2	Age>60 Group 3
Number of patients (M/F)	57 (46/11)	57(47/10)	52(42/10)
Mean age (years)	41+/-8	55+/-2	65+/-4
Duration (years)	5+/-3	5+/-4	6+/-3
Left atrial size (cm)	4+/-0.3	4.2+/-0.4	4.3+/-0.5
Follow-up	5.8+/-3.4	6+/-3.5	5.6+/-3.1
Recurrence	7% (2/57)	23%(13/57)	17%(9/52)
Controlled on AAD	3.5% (2/57)	5% (3/57)	8%(4/57)
Tamponade	0	0	4%(2)
Stroke	0	0	4% (2)

8:45 a.m.

885-2 Clinical Significance of Early Recurrence of Atrial Fibrillation After Pulmonary Isolation in Patients With Paroxysmal Atrial Fibrillation

Hakan Oral, Hiroshi Tada, Mehmet Ozaydin, Aman Chugh, Sohail Hassan, Christoph Scharf, Radmira Greenstein, Frank Pelosi, Jr., Bradley P. Knight, S. Adam Strickberger, Fred Morady, *University of Michigan, Ann Arbor, Michigan.*

Background: Radiofrequency (RF) catheter ablation of the pulmonary vein (PV) ostia using a segmental approach is performed to electrically disconnect the arrhythmogenic foci within the PV's from the left atrium. Early recurrence of atrial fibrillation (ERAF) within 24 hrs after the ablation is occasionally encountered. The clinical significance of ERAF has not been evaluated.

Objective: To determine the prevalence and clinical significance of ERAF after isolation of PVs in patients with paroxysmal or persistent atrial fibrillation (AF).

Methods: PV isolation was performed in 51 men and 11 women (mean age ± SD = 52 ± 11 years) who had paroxysmal or persistent AF for 6.2 ± 5.8 years. One patient had ischemic heart disease and 3 had nonischemic cardiomyopathy. AF was paroxysmal in 54 and persistent in 8 patients. All PVs with PV potentials were targeted using activation mapping guided with a decapolar Lasso catheter positioned within 5mm of the ostium. Complete electrical isolation was determined by elimination of all high-frequency PV potentials. ERAF was defined as any episode of atrial fibrillation that occurred within 24 hours after the ablation procedure.

Results: In 49 patients, the left superior and inferior and right superior PVs (LSPV, LIPV, and RSPV) and in 13 patients, all 4 PVs were targeted. Of the 198 PV's, 183 (95%) were completely isolated. In 48 of 62 patients (77%), all targeted PVs were completely isolated. ERAF occurred in 7 of 62 patients (11%). Among the 7 patients with ERAF, there was no significant difference in the incidence of ERAF between patients who had complete (n=4) and incomplete (n=3) isolation of all targeted PVs (p=NS). After 55±42 days of follow-up, 3 of the 7 patients who had ERAF were free of AF, 1 had significant improvement in the frequency of symptoms and 3 had no improvement. The incidence of recurrence of AF was similar in patients with ERAF who had complete (2 of 4) and incomplete (2 of 3) isolation.

Conclusions: ERAF within 24 hours may not be predictive of the clinical outcome during the first several weeks of follow-up. This implies that ERAF may be caused by a transient phenomenon such as an acute inflammatory response.

9:00 a.m.

885-3 Pulmonary Veins Isolation for Treatment of Atrial Fibrillation in Patients With Impaired Left Ventricular Function

Alejandro Perez-Lugones, Nassir F. Marrouche, Walid Saliba, Christopher Cole, Ahmad Abdul-Karim, Robert Schweikert, David O. Martin, Eduardo Saad, Thomas Dresing, Andrea Natale, *Cleveland Clinic Foundation, Cleveland, Ohio.*

Background: Pulmonary veins (PVs) isolation for the treatment of atrial fibrillation (AF) has been well defined. The efficacy and safety of this approach in patients with impaired LV function (LVF) is lacking. In this study we describe the long-term success rates and follow-up of PVs isolation using the circular mapping technique in patients with impaired LVF. Methods and Results: Out of 182 patients (141 men; mean age 53+/-11 years) underwent focal mapping and ablation of AF 17 (9%) presented with impaired LVF (mean ejection fraction 38+/-7%, range 25-45%). Mean left atrial size and AF duration were 5+/-0.4 cm and 7+/-5 years, respectively. Ten patients had ischemic cardiomyopathy (CM), 3 idiopathic CM, 3 valvular heart disease, and 1 hypertensive heart disease. All patients failed 4 +/- 0.9 antiarrhythmic drugs (AAD). 58 PVs were mapped and successfully ablated using circular mapping. After a mean follow-up of 5+/-2 months, 3 patients (17%) experienced recurrence of AF. Two are controlled on drugs and one underwent successful re-ablation. No PV stenosis (>50% narrowing) was seen in these patients.

Conclusion: Isolation of the PV for the treatment of atrial fibrillation appeared effective and safe in patients with impaired LV function. In this preliminary experience, the response to PV isolation of patients with LV dysfunction was similar to the rest of the population undergoing the procedure.

9:15 a.m.

885-4 Clinical Significance of Residual Pulmonary Vein Potentials After Pulmonary Vein Isolation in Patients With Paroxysmal Atrial Fibrillation

Hakan Oral, Hiroshi Tada, Mehmet Ozaydin, Sohail Hassan, Christoph Scharf, Aman Chugh, Radmira Greenstein, Frank Pelosi, Jr., Bradley P. Knight, S. Adam Strickberger, Fred Morady, *University of Michigan, Ann Arbor, Minnesota.*

Background: After electrical isolation of pulmonary veins (PVs), low-amplitude, low-frequency PV potentials may persist despite vigorous attempts at ablation. The purpose of this study is to determine the prevalence and clinical significance of these potentials.

Methods: In 51 men and 11 women (mean age ± SD = 52 ± 11 years) with atrial fibrillation (duration = 6.2 ± 5.8 years; 14 ± 12 episodes per month), PV isolation was guided by identification of PV potentials recorded with a circular mapping catheter. Atrial fibrillation was paroxysmal in 54 and persistent in 8 patients. All PVs with fascicular PV potentials were targeted. Radiofrequency (RF) energy was delivered at the earliest activation site within 5mm of the ostium at a maximum temperature of 52°C and a power of 35W for 45 secs. Complete isolation was defined as the elimination of high frequency PV potentials and / or dissociation of the electrical activity within a PV from the left atrium. Residual potentials were defined as low-amplitude (<0.5mV) and low-frequency potentials that fol-